DEVELOPMENT OF PORTABLE DESK FOR BIOMECHANICS EQUIPMENT

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ABSTRACT

The objective of this project is to design and fabricate a portable desk and camera stand. Portable desk main function is it can place the biomechanics equipment into it. Besides that, it can place the desktop so that the high speed camera can be attach into it during outdoor session. For the camera stand, it mainly function is to attach the high speed camera from top view. Tripod camera that have been sell in market can be a camera stand that can take a picture from bottom and front view. The material that have been used to fabricating the portable desk is mild steel while material used to fabricating the camera stand is aluminum. The portable desk have wheel so that the portable desk can be brought anywhere easily. The process that involved to fabricating both portable desk and camera stand is welding, drilling, grinding, cutting and riveting. There are also several problems faced during the fabrication process. Material selection was one of the biggest problems. In order to find the most suitable raw material for the portable desk and camera stand, research and information are searched through reliable source. Wrong selection of material will cause a lot of difficulties during fabrication process and will lead to more trouble in the future. The problem is counter by make some research from the internet and book. Lastly, the objective of this project has been achieved where the portable desk can been brought anywhere easily while the camera stand can been used to attach the high speed camera into it. The experiment can be conducted during outdoor session.

ABSTRAK

Objektif projek ini adalah untuk mereka cipta dan mereka bentuk meja mudah alih dan batang kamera. Fungsi utama meja mudah alih ini adalah untuk meletakkan peralatan biomekanik ke dalamnya. Selain itu, komputer meja juga boleh diletakkan di dalamnya untuk digunakan bersama kamera mengesan kelajuan tinggi semasa experiment dijalankan di luar makmal. Kegunaan utama batang kamera adalah untuk meletakkan kamera mengesan kelajuan tinggi untuk mengambil gambar dari pandangan atas. Batang kamera yang telah dijual di pasaran boleh dijadikan batang kamera untuk mengambil gambar dari pandangan bawah dan depan. Bahan yang telah digunakan untuk membina meja mudah alih adalah keluli lembut manakala bahan yang digunakan untuk membina batang kamera adalah aluminium. Meja mudah alih mempunyai roda supaya ianya boleh dibawa ke mana-mana sahaja dengan mudah sekali. Proses yang terlibat untuk pemasangan meja mudah alih dan batang kamera ini adalah kimpalan, penggerudian, menggiling, memotong dan rivet. Terdapat beberapa masalah yang dihadapi semasa proses mereka cipta ini dijalankan. Memilih bahan adalah antara masalah terbesar. Untuk memastikan bahan yang sesuai dalam mereka cipta meja mudah alih dan batang kamera adalah dengan membuat kaji selidik. Jikalau bahan yang dipilih salah maka masalah yang lebih besar yang perlu dihadapi di masa hadapan. Masalah ini dihadapi dengan membuat beberapa kajian dengan merujuk bahan-bahan di internet dan buku bagi mengelakkan masalah yang lebih besar. Akhir sekali, objektif projek ini telah dicapai di mana meja mudah alih boleh dibawa ke mana sahaja dengan mudah manakala batang kamera boleh digunakan untuk meletakkan kamera mengesan kelajuan tinggi ke dalamnya. Eksperimen boleh dijalankan luar daripada makmal.

TABLE OF CONTENTS

CHAPTER 4 RESULTS AND DISCUSSION

CHAPTER 5 CONCLUSION AND RECOMMENDATION

LIST OF TABLES

LIST OF FIGURES

CHAPTER 1

INTRODUCTION

1.1 INTRODUCTION

The purpose of this chapter is to explain about the project background, problem statement, project objectives, project scopes, flow chart of the project as well as Gantt chart to present the flow and overall process for this project.

1.2 PROJECT BACKGROUND

Nowadays, there are various type of portable desk that have been invented. It comes with many design. Some have round shape, square shape and many more. Portable desk specially design for bring any item that can bring it anywhere. Besides that, the item can be safely store in it. Portable desk mostly have wheel that can pull and push so that it is easily to bring anywhere.

However, the portable desk has its own advantages and disadvantages. Even though, the portable desk have wheel that will facilitate the owner but when it comes to difficult situation it will trouble the owner. For example, the portable desk have wheel that can pull and push it anywhere but the problem is when it comes to stairs. The owner need to carry the portable desk upstairs or downstairs.

Therefore, biomechanics equipment need a portable desk that can bring it anywhere so that the experiment can be conducted outdoor. Some of biomechanics equipment is high speed camera, electromyography (EMG), echocardiography (ECG), accelerometer, gyro meter etc.

1.3 PROBLEM STATEMENT

One of biomechanics is high speed camera. A high speed camera is a device used for recording fast-moving objects as a photographic image onto a storage medium. High speed camera need three stand camera for place it in front, top and bottom. For camera in front and bottom view can be place using a tripod camera. The problem is when the camera need to take a picture in top view. The high of tripod camera is about 1 m to 1.5 m. Tripod stand for top view need at least 2 m to 3 m.

Besides that, high speed camera can be detected using a desktop only. So, without desktop the high speed camera cannot be running. High speed camera cannot be detected using a laptop. There is no problem if the experiment is being held indoor. The problem is when the experiment is being held outdoor. The portable desk is needed to bring desktop anywhere so that the experiment can be conducted outdoor.

1.4 OBJECTIVE

1. To fabricate a portable desk that can place the biomechanics equipment to bring anywhere easily.
2. To make sure the experiment can be conducted in outdoor session using both desktop and high speed camera.
3. To fabricate the stand camera that exceed the high limit to take a picture from top view.

1.5 SCOPE

1. Portable desk is fabricating using a hollow square and sheet metal.
2. Material used for both hollow square and sheet metal is mild steel.
3. Size for hollow square is 1 inch while sheet metal is 2 mm.
4. The material used for camera stand is aluminium.
5. The size used is hollow aluminium ½ inch, ¾ inch and 1 inch.
6. Camera stand can exceed high limit about 3 m length.

1.6 PROJECT GANTT CHART

Task		W1	W2	W3	W4	W5	W6	W7	W8	W9	W10	W11	W12	W13	W14	W15
Literature Review	Plan															
	Actual															
Problem identification	Plan															
	Actual															
Concept Design	Plan															
	Actual															
Finalize Design	Plan															
	Actual															
Analyse Structure	Plan															
	Actual															
Mid Presentation	Plan															
	Actual															
Fabrication	Plan															
	Actual															
Testing & Improvement	Plan															
	Actual															
Final Report Preparation	Plan															
	Actual															
Final Presentation Preparation and final presentation	Plan															
	Actual															

Figure 1.1: Gantt chart

1.7 THESIS ORGANIZATION

Chapter 1 will explains about the introduction, project background, problem statement, objective, scope, project flow chart and project Gantt chart. This chapter planned about the flow of my project.

Chapter 2 which is the literature review mainly will explain about the advantages and disadvantages of market existing products and also the comparison between these products.

Chapter 3 which is the methodology and this chapter will explains about the concept design and also the finalize concept of the design. It also explains about the fabrication process and machining used.

Chapter 4 which is the results and discussion and this chapter will explains about the finalize product that have been made. The product is then being tested to find out its effectiveness in solving the problem statement.

Chapter 5 mainly explains about the conclusion and recommendation that can be made to the product.

CHAPTER 2

LITERATURE REVIEW

2.1 INTRODUCTION

This chapter will explain about the literature review of all the market existing products. However these existing portable desk that have been sell in market have their own advantages and disadvantages.

2.2 PRODUCT REVIEW

This topic explains about the existing products in the market and comparison about their advantages and disadvantages.

2.2.1 PRODUCT A

Figure 2.1 : Product A

Advantage :-

- It is light
- Easy to bring anywhere because have wheel.
- It is also easy to assemble.
- Can used anywhere for example office or home.

Disadvantage :-

- No surface cover so the probability of the item to fall down is high.
- The table is small and just enough to put a desktop but no space for other item.

Material used :-

- Steel is used in framework part.
- Plastic is used to cover the surface.

2.2.2 PRODUCT B

Figure 2.2 : Product B

Advantage :-

- Space is larger so can put many item above it
- Comfortable
- Item can put a safe condition

Disadvantage :-

- Completely used at home
- A bit heavy
- A bit difficult to carry it anywhere because have no wheel.

Material used :-

- Mostly material used is wood.
- Glass only used to cover the surface

2.2.3 PRODUCT C

Figure 2.3 : Product C

Advantage :-

- Easy to bring anywhere because the table can be pull or push.
- Top of the table can be closed. The function is to prevent the item from fall down during the table is moved. Besides that, it also can avoid dust from the item. So, the table can be closed after using it.
- Have large surface so many item can be place.

Disadvantage :-

- A bit heavy.
- Table too large to bring it anywhere.

Material used :-

- Mostly material used is wood.
- Stainless steel is used for make the leg of the table

Table 2.1 : Comparison between existing products

Aspect	**Product A**	**Product B**	**Product C**
Easy to bring anywhere	Yes	No	Yes
Ease of use	Yes	Moderate	Yes
Save cost	Yes	Yes	No
Comfort ability	No	Yes	No
Size	Small	Medium	Big
Durability	No	Yes	No

Table 2.1 shows the comparison between existing products that shown in figure 2.1, figure 2.2 and figure 2.3. This table have shown that Product A, Product B and Product C has its own advantages and disadvantages.

2.3 FABRICATION EQUIPMENT

There are various types of machining that will be used in carrying out the fabrication process. Below are details about the machining equipment used.

2.3.1 Shearing Machine

Figure 2.4 : Shearing machine

Source: http://image.made-in-china.com/2f0j00dMLaHqyUkZkF/Shearing-Machine.jpg

Shearing machine also known as die cutting machine. Shearing machine is used to cut sheet metal without the formation of chips or the use of burning or melting. A blade is used to push the workpiece against the die which is fixed. This action will cause the material to experience shear stresses between the punch and the die.

2.3.2 Angle grinder

Figure 2.5 : Angle grinder

Source: http://metalworkingmachine.net/wp-content/uploads/2011/02/angle-grinder-.jpg

Angle grinder is also known as disc grinder which is a power tool used for cutting, grinding and polishing. Angle grinders can be powered by an electric motor, petrol engine or compressed air. The motor drives a geared head on which is mounted an abrasive disc. Angle grinders usually have an adjustable guard and a side handle for two handed operation.

2.3.3 Gas Metal Arc Welding

Figure 2.6 : Gas Metal Arc Welding

Source :http://en.wikipedia.org/wiki/Gas_metal_arc_welding

Gas metal arc welding (GMAW), sometimes referred to by its subtypes metal inert gas (MIG) welding or metal active gas (MAG) welding, is a welding process in which an electric arc forms between a consumable wire electrode and the workpiece metal, which heats the workpiece metal, causing them to melt, and join. Along with the wire electrode, a shielding gas feeds through the welding gun, which shields the process from contaminants in the air.

2.3.4 Drilling

Figure 2.7 : Drilling

Source :https://en.wikipedia.org/wiki/Drill

A drill is a tool fitted with a cutting tool attachment or driving tool attachment, usually a drill bit or driver bit, used for drilling holes in various materials or fastening various materials together with the use of fasteners. The attachment is gripped by a chuck at one end of the drill and rotated while pressed against the target material. The tip, and sometimes edges, of the cutting tool does the work of cutting into the target material.

2.3.5 Rivet

Figure 2.8 : Rivet

Source: http://img.ehowcdn.com/article-page-main/ehow/images/a07/67/m1/arrow-rivet-tool-instructions-800x800.jpg

Rivet is a permanent mechanical fastener. A blind rivet is one of the types of rivet. The rivet assembly is inserted into a hole drilled through the parts to be joined and a rivet gun is used to draw the mandrel into the rivet. There are three types of rivets size available in the market which is the aluminium blind rivets size 1/8", 3/32" and 1/16".